

# *Pteris quadriaurita* Retz. and a few related taxa in Kerala State<sup>1</sup>

N. C. NAIR<sup>2</sup> AND S. R. GHOSH<sup>3</sup>

*Pteris quadriaurita* Retz. is considered to be a Sri Lanka and South Indian species. Reports of this taxon from other parts of Indian subcontinent need confirmation. Additional information about *P. multiaurita* Agardh is provided. These two taxa hybridize freely in nature. *P. confusa* Walker, *P. gongalensis* Walker and *P. praetermissa* Walker are recorded for the first time from India.

*Pteris quadriaurita* Retz. and related taxa represent one of the most confusing assemblage of ferns whose taxonomic separation is extremely difficult and consequently several species have been passed off in the past as *P. quadriaurita* Retz. On a study of this bewildering group in Kerala we have come across some interesting findings which are recorded below. The specimens mentioned are deposited in the herbarium of the Cryptogamic Unit of the Botanical Survey of India, Sibpur, Howrah.

1. *Pteris quadriaurita* Retz. was named and described in 1791 by Retzius based on a specimen from Sri Lanka collected by King. The circumscription of the species varied according to different authors. Hooker (1858) and Hooker & Baker (1868) used the name in a very wide sense and considered *P. nemoralis* Hook. et Baker, *P. biaurita* var. Sw., and *P. calcarata* Bory as synonyms. A more or less similar view was held by Agardh (1839). Clarke (1880) has included *P. aspericaulis*

Wall. ex Agardh, *P. pectinata* Don, *P. pyrophylla* Blume, *P. spinescence* Presl, and *P. subquinata* Wall. ex Agardh as synonyms of *P. quadriaurita* Retz. in addition to *P. nemoralis* Hook. et Baker. He also distinguished three varieties namely, *major*, *khasiana* and *blumeana*. Beddome (1883, 1892) recognised Clarke's varieties and added another variety *setigera*. *P. subindivisa* Clarke, *P. subquinata* Wall. ex Agardh and *P. aspericaulis* Wall. ex Agardh are also treated as varieties. Beddome (1863) gave two figures, one for *P. otaria* and another for *P. otaria* var. The latter bears a mark of interrogation. A few years later he (1883) considered *P. otaria* Bedd. as the same as *P. quadriaurita* var. *ludens* Bedd.

Hieronymus (1914) showed that the name *P. quadriaurita* Retz. was misapplied to several taxa, gave a new description to it, and recognised (1911, 1914) several new species in the original circumscription of the species. Blatter & Almeida (1922) expanded the description to embrace three species, *P. quadriaurita* Retz., *P. biaurita* Linn., and *P. nemoralis* Willd. thereby creating more confusion in the study of this group of Indian ferns.

Beddome (1892) gave the distribution of

<sup>1</sup> Accepted January 1974.

<sup>2</sup> Botanical Survey of India, R.S. Puram, Coimbatore 641 002.

<sup>3</sup> Botanical Survey of India, Sibpur, Howrah 711 103.

*P. quadriaurita* Retz. as follows, "Throughout India, Sri Lanka and Malay Peninsula, from the plains up to 8000 feet, very common. (Also all round the world throughout the tropics and a little beyond them)". In giving this distribution he faithfully followed Hooker (1858), and Hooker & Baker (1868). This seem to be the reason for the supposition by Indian authors that the taxon exists throughout India. An examination of the material in the Cryptogamic Unit of the Botanical Survey of India, Sibpur, confirmed the view of Walker (1958) that the true *P. quadriaurita* Retz. does not occur outside Sri Lanka and South India. Therefore the reported occurrence of *P. quadriaurita* Retz. from Assam (Kachroo 1953), Darjeeling (Mehra & Bir 1964), Eastern India (Panigrahi 1960), Eastern Himalayas (Hara 1966), Kashmir (Stewart 1945), Madhya Pradesh (Tiwari 1964), Mussoorie (Mehra 1939), Nainital (Loyal 1960), North-Western India (Hope 1901), Orissa (Mooney 1950); Panigrahi *et al.* (1964) and Simla (Bir 1963) etc. needs confirmation.

***Pteris quadriaurita*** Retz. Obs. 6:38, 1791; Willd. Sp. Pl. 385, 1810; Agardh, Gen. Pter. 24, 1839; Bedd. Handb. Ferns Brit. Ind. 110, 1883 (pro parte); Hieron. in Hedwig. 55:1914; Walker in Evolution 12: fig. 4 top right, 1958; Kew Bull. 14:324; fig. 1, 1a, t. 5, fig. c, I, 1960.

Rhizome erect. Fronds variable in size. Stipe tufted, stramineous 40-45 cm long, grooved, glabrous. Lamina 30-35 cm or more semi-coreaceous. Rachis grooved, stramineous. Pinnae 4-10 subopposite pairs, the lowest bipartite, narrowly oblong, acuminate and cut down into several oblong segments  $1.5 \times 0.8$  cm, apex rounded, serrated, sinus nearly reaching the costa. Veins usually once-forked, free, 6-10 pairs, lowest vein reaching the margin above sinus, long spinules present on the costa

and costule. Sorus not reaching the sinus and apex of the segments. Indusia membranous, white. Spores light brown or honey coloured, about  $30 \mu$  in diameter, tuberculate.

In Kerala this fern appears to be not very common. It is seen in small populations on the margin of forests where the ground vegetation is sparse. Wherever human interference is common this species is either very rare or absent.

Diploid and sexual material have chromosome numbers  $n = 29$ ,  $2n = 58$  (Abraham *et al.* 1962; Manton & Sledge 1954; Walker 1960).

MATERIAL EXAMINED—Vennikulam, N. C. Nair 50824 (Dec. 16, 1972); Vennikulam—Thiruvella, N. C. Nair 50832 (Dec. 16, 1972).

Plants having general similarity and affinity with *P. quadriaurita* Retz. but with extremely varying degrees of abortive pinnules are abundant and widely distributed along road-sides, riverbanks, paths through forests, as undergrowth in forests, in well lighted places, and in forests where human interference is common. Thwaites (1864) and Walker (1958, 1960) state that an array of such forms are abundant in Sri Lanka. Some of the Kerala forms have serrate apex for ultimate pinnules. Others lack this character. Some have spinules on ultimate pinnules; others have none. All gradations from wiry to rigidly erect habit can be met with. Similar wide range of variation is very common. These forms were named as *P. otaria* by Beddome (1863) and later (1883, 1892), *P. quadriaurita* var. *ludens* Bedd. Thwaites (1864) suggested that some of the forms were of hybrid origin. He was also of the opinion that another pinnate species *P. ensiformis* Burm. might also be involved here. But *P. ensiformis* Burm. is a tetraploid with  $n = 58$  (Abraham *et al.* 1962),  $2n = 116$  (Walker 1958). Further, when Walker (1958) crossed it with *P. otaria* Bedd. triploid

hybrids were formed showing complete failure of chromosome pairing. Giesenhagen (1918) concluded that *P. otaria* Bedd. is nothing but developmental stages. He attributed the abortion of the pinnules to lack of availability of nutrients to the juvenile fronds. After making a comprehensive study of cytotaxonomy and hybridization, Walker (1958) has clearly shown that *P. otaria* Bedd. is nothing but a hybrid between *P. quadriaurita* Retz. and *P. multiaurita* Agardh. Where the natural habitat of these two taxa have been disturbed by man these species frequently hybridize and an imposing array of hybrid swarms exhibiting an intricate segregation marked by differently and irregularly pinnatifid pinnae are formed (see Walker 1958). In spite of the fertile hybrid nature of *P. otaria* Bedd., Abraham *et al.* (1962) treat it as a distinct taxon. In Kerala *P. quadriaurita* Retz. × *P. multiaurita* Agardh. hybrid swarms are more common than the parents. This speaks for the large scale human interference in the ecological preferences of the parent species.

*Specimens examined*.—Aryankavu, *N. C. Nair* 50673, 50674, 50690, 50694, 50697, (Dec. 24, 1972); Kulathupuzha, *N. C. Nair* 50656, 50663, (Dec. 23, 1972); Punalur, *N. C. Nair* 50884, 50886 (Dec. 26, 1972); Ranni, *N. C. Nair* 50589 (Dec. 18, 1972); Vennikulam, *N. C. Nair* 50827, 50829, 50834, 50846, 50847 (Dec. 16, 1972).

2. *Pteris multiaurita* Agardh was considered as a synonym of *P. cretica* Linn. by Beddome (1863). In his Handbook (1883) and Supplement (1892) no mention is made of *P. multiaurita* Agardh. Christensen (1906) also considered *P. multiaurita* Agardh as the same as *P. cretica* Linn. *Pteris cretica* Linn. and *P. multiaurita* Agardh are clearly distinct species, differing in several characters. The confusion seems to be due to the simply pinnate

nature of the two taxa. They can be easily distinguished by the following key:

Pinnae on each side 11-13; lateral veins of pinnae usually twice forked; spinules present on the sterile pinnae; rhizome creeping . . . . *P. multiaurita*  
Pinnae on each side 4-6; lateral veins of pinnae usually once-forked; spinules absent in the sterile pinnae; rhizome not creeping, erect . . . . *P. cretica*

Walker (1958, 1960) thinks that *P. multiaurita* Agardh is allied to *P. quadriaurita* Retz., since they hybridize freely producing fertile hybrids (see above).

Agardh (1839) states that *P. multiaurita* Agardh is a Sri Lanka species. He also adds that he has seen a sheet in Paris Museum collected from Nilgiri mountains by Leschenault. It is significant that no subsequent author has recorded this species from India. We have made several gatherings of this taxon from Kerala.

***Pteris multiaurita* Agardh, Rec. Sp. Gen.**  
Pteridis 12, 1839; Walker in Kew Bull. 14:323, 1960.

Rhizome creeping. Fronds dimorphous, simply pinnate, semi-coriaceous or herbaceous. Stipe of sterile frond 12-25 cm long glabrous, wiry, stramineous, grooved, scaly and black at the base. Pinnae 8-10 cm × 0.6-0.8 cm petiolate; petiole 0.2 mm, most pinnae except apical ones bipartite, apex acuminate, margin entire except a few denticulations towards the tip; veins free, mostly twice forked. Long spinules present on the costa of the sterile pinnae. Fertile frond much larger than the sterile frond. Stipe 35-44 cm long, grooved. Pinnae 10-13 × 0.8 cm. Veins twice forked. Spinules mostly absent. Indusium hyaline. Spores light brown to dark brown.

As mentioned above this species freely hybridizes in nature with *P. quadriaurita* Retz. and according to Walker (1958) these two species are separated in nature by ecological barriers only. This species has a preference

for lightly shaded areas such as the edge of forests, road sides etc.

*Specimens examined*.—Kulathupuzha, *N. C. Nair* 50657 (Dec. 23, 1972); Pathanamthitta, *N. C. Nair* 50586 (Dec. 18, 1972), 50859 (Dec. 12, 1972); Ranni, *N. C. Nair* 50590 (Dec. 18, 1972); Thiruvella, *N. C. Nair* 50840 (Dec. 16, 1972).

3. Walker (1960) described a new species *P. gongalensis* from Sri Lanka. This species is distinguished from other members of the *P. quadriaurita* Complex by (1) the deltoid frond, (2) the spinules throughout inconspicuous, (3) the very regular appearance of pinnae, (4) non serrated apex of the ultimate segments, (5) large dark brown spores intermixed with mishappen spores, and (6) the sculpturing and size of the spores.

According to Walker (1960) this species is endemic to Sri Lanka. But one of us has collected it from several localities in Kerala. This discovery is not surprising since Kerala is not far removed from Sri Lanka and the climatic conditions are almost identical.

***Pteris gongalensis*** T. G. Walker in Kew Bull. 14:328, fig. 4, 4a, t. 5, fig. A, G., 1960.

Rhizome short erect. Stipes 20-60 cm, stramineous grooved. Lamina deltoid, up to 50 cm long, 16-32 cm broad, lateral pinnae 5-8 pairs, herbaceous 2 cm long, lanceolate, lowest bipartite, terminal pinnae of the same size and shape, pinnae regularly pinnatifid, sinus about 1 mm from the costa; segments oblong 1.2-2.2 × 0.4-0.6 cm, apex rounded not serrated; veins free, 9-14 pairs; spinules present on the costa and costules, inconspicuous. Indusium very narrow, papery, white. Sori continuous except base and apex of segments. Spores tetrahedral globose.

Not a common fern in Kerala.

Chromosome number in the gametophyte and the sporophyte of Sri Lanka material is

87 (Walker 1960).

*Specimens examined*.—Nadukani (near Idiki alt. 800 m), *N. C. Nair* 40727 (Dec. 27, 1970), on moist slopes in shade; Thankamani (800 m), *N. C. Nair* 40755 (Dec. 28, 1970), near stream along footpaths and on steep slopes in shade; Vennikulum, *N. C. Nair* 50845 (Dec. 16, 1972).

4. A second new species having close affinity with *P. quadriaurita* Retz. described by Walker (1960) is *P. confusa* Walker which can be distinguished by the stramineous stipe, sinus not nearly reaching the costa, the presence of well-filled spores intermixed with mishappen abortive ones, and the conspicuous spore markings. According to Walker (1960) this is an apogamous diploid with 59 chromosomes. This species has certain features of similarity with *P. biaurita* Linn. These two species can be easily separated by its venation, *P. biaurita* Linn. has basal veins which anastomose and form a costal arch whereas *P. confusa* has free veins. This is the first report of the taxon from India.

***Pteris confusa*** T. G. Walker (in Evolution 12: 88, fig. 4, tip middle, nomen et fig.) in Kew Bull. 14:329, fig. 5, 5a, t. 5, fig. B, J, 1960.

Rhizome short erect. Stipe 30-70 cm, stramineous, base chestnut brown. Lamina green, ovate 56 cm long, lateral pinnae 4-9 pairs; 12-27 cm long about 3 cm broad, lowest bipartite, regularly pinnatifid; segments oblong 1.5 × 0.4 cm, about 26 pairs, apex entire; veins free 12-14 pairs; sinus nearly 2 mm from costa, spinules absent or very few at the crossing of costa and costule. Indusium thin, papery. Spores tetrahedro-globose.

This appears to be a rare fern in Kerala.

*Specimens examined*.—Kumuli (alt. 750 m), *N. C. Nair* 40463 (Oct. 16, 1968); Neriangan-galam, *N. C. Nair* 50711 (Jan. 7, 1973); Thankamani (alt. 800 m), *N. C. Nair* 40417 (Dec.

1970).

5. A third species described by Walker (1960) namely, *P. praetermissa* Walker was considered to be endemic to Sri Lanka. This is recorded here for the first time from India. This taxon can be distinguished from other allied species by the characters such as the presence of long, conspicuous spinules on the costa, the usually dark colour of the rachis and stipe, the long spinules on the segments, the sinus extending almost to the costa and the characteristic spore.

Sri Lanka plants are sexual diploids having chromosome number  $x = 29$  and  $2x = 58$  (Walker 1960).

*Pteris praetermissa* T. G. Walker in Kew Bull. 14:327, fig. 3, 3a, t. 5, fig. F. 1960.

Rhizome short, erect stipes tufted 20-50 cm long, purpureus, base blackish, glabrous. Rhachis stramineous glossy. Lamina ovate 17-40 cm, lateral pinnae 4-8 pairs oblong, acuminate, 13-15 × 3 cm, regularly pinnatifid, segments 14-25 pairs, apex rounded not serrated, veins free 9-12 pairs, long spinules are present on costa and costule. Sinus not greater than

1-33 mm from the costa. Indusia white, continuous; sorus not reaching the sinus and apex of the segments.

This is a very common species in Kerala growing along road sides, near streams and in jungles both open and closed.

Sri Lanka plants are sexual diploids according to Walker (1960) and have chromosome numbers  $x = 29$  and  $2x = 58$ .

*Specimens examined*.—Chadayamangalam *N. C. Nair* 50929 (Dec. 31, 1972); Kaviyur, *N. C. Nair* 50808 (Dec. 15, 1972); Kottarakara, *N. C. Nair* 50921 (Dec. 30, 1972); Kulathupuzha, *N. C. Nair* 50642 (Dec. 22, 1972), 50644 (Dec. 22, 1972), 50667 (Dec. 23, 1972); Kunnunthanam, *N. C. Nair* 50812 (Dec. 15, 1972), 50821 (Dec. 15, 1972), Pathanamthitta, *N. C. Nair* 50593 (Dec. 12, 1972); Perunna (alt. 30 m), *N. C. Nair* 40268A, 40268B (Dec. 12, 1970); Punalur, *N. C. Nair* 50878 (Dec. 26, 1972), 50881 (Dec. 26, 1972), 50909 (Dec. 28, 1972), 50913 (Dec. 28, 1972); Thiruvella, *N. C. Nair* 50805 (Dec. 15, 1972); Vennikulum, *N. C. Nair* 50835 (Dec. 16, 1972).

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Gattung Pteris. II. Über *Pteris quadriaurita* Retz. und einige asiatische malesische und polynesische *Pteris* Arten aus der Gruppe und Verwandtschaft dieser Art. *Hedwigia* 55:325-375.

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